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NELSON, MICHAEL E				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/535,311

Applicant(s)

FUNAHASHI ET AL.

Examiner

MICHAEL E. NELSON

Art Unit

1794

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 April 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF/ICE)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Status of Claims

1. Claims 1-25 are pending. Claim 2 has been amended. Claims 14-25 have been added.

Specification

2. The disclosure is objected to because of the following informalities:
3. In Table 1, on page 44, the abbreviation for Valence electron level (**EC**) should be corrected to match the terminology used in the specification, (**EV**). Likewise, the abbreviation for energy gap (**EC**) should be corrected to match the terminology used elsewhere in the specification, (**EG**).

Appropriate correction is required.

Claim Objections

4. Applicant is advised that should claim 14 be found allowable, claim 19 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1-25 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for certain materials, does not reasonably provide enablement for the full scope of the invention as claimed. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.
7. Claims 1, 2 and 14 claim an electroluminescent device where the light emitting layer comprises 3 materials, a light-emitting-layer material, a first dopant and a second dopant, with the relationship of the materials based on the relative valence energy (EV) and conductance energy (EC) and band gap difference (EG). The specification gives a few examples, and gives a list of potential materials suitable for the light-emitting-layer material (pages 16-20) and the dopant materials (page 22-25).
8. However, the scope of the claims encompasses **ALL** materials based simply upon a relationship between the EC, EV and EG values. As a result, an individual of ordinary skill in the art would have to test **ALL** (essentially trial and error) materials to practice the full scope of the invention as claimed. The specification does give some guidance in the form of particular materials, as given in the specification, but does not give guidance as to what **other** materials could be used as either the light-emitting-layer materials or the dopant materials. Short of trial and error, which falls well within the realm of unreasonable experimentation, an individual of ordinary skill would be unable to make the full scope of the invention as claimed; it is clearly undue experimentation.

9. The specification describes basic methods for the measurement of the two critical values (the EV and EG values). The EV value is determined by photoelectron spectroscopy using a specific instrument. However, even the same material measured on the same instrument (Riken Keiki model AC-1) by different researchers produces different values. For example, NPD (same as NPB) which is reported by applicant to have a valence electron level of 5.4 eV, is reported by Sato et al. (IEEE Journal of Selected Topics in Quantum Electronics, vol. 4, no. 1, pp. 40-48, Jan/Feb. 1998) with a value of 5.20 eV (see Table 1, and last paragraph of section II on page 42). The same material on the same instrument is reported by Adamovich et al. (New Journal of Chemistry, vol. 26, pp. 1171-1178, Aug 2002) with a value of 5.7 eV (See Fig. 4 and under heading "Estimation of HOMO and LUMO energies" on page 1173). Therefore, it is clear that using the same methodology disclosed in the specification would not enable one of ordinary skill to reproduce the values required with the degree of accuracy and precision necessary given the scope of the disclosure. Since any given compound could reasonably be predicted to vary by as much as 0.5 eV in the Valence electron level, selecting compounds based on this criteria would not be predictive.

10. The specification likewise give methods for determining the Energy Gap (EG), where the absorption spectrum in benzene was measured with a spectrophotometer and the energy gap calculated from the wavelength in which the spectrum begins to raise (pages 38 and 39 of the specification). However, the specification does not disclose other essential features which would enable an individual of ordinary skill to reproduce the values for the compounds disclosed, and therefore be able to utilize the

method to select other compounds. Laqua et al. (Pure and Applied Chemistry, vol. 60, pp. 1449-1460, 1988) disclose the numerous factors which can influence the UV/Vis spectrum. These include instrumentation effects (see section 3), and non-instrumentation based factors (see sections 5-7 and Table X.1). A major factor which is not disclosed in the specification is the concentration of the samples used for measurement, which can cause significant uncertainty when the sample concentration is large or small (see section 5.1). A second major factor is the solvent, which is specified as benzene, but does not account for compounds which are insoluble in benzene, or too poorly soluble in benzene to produce accurate results. The method described in the specification also requires the arbitrary selection of the point at which the spectrum begins to raise, which is not detailed enough to enable one of ordinary skill to accurately reproduce the values of the compounds described in the specification, and therefore be able to utilize the method to select other suitable compounds. Using the NPD example from above, while the specification discloses a bandgap for NPB of 3.1 eV, Sato et al. (IEEE Journal of Selected Topics in Quantum Electronics, vol. 4, no. 1, pp. 40-48, Jan/Feb. 1998) discloses an energy gap of 2.91 eV (see Table 1). The same material is reported by Adamovich et al. (New Journal of Chemistry, vol. 26, pp. 1171-1178, Aug 2002) with a value of 3.0 eV (See Fig. 4)

11. While the variations appear small, given the nature of the claimed invention, and especially the very close values of the specific compounds, it is apparent that even quite small differences in the measured values (less than 0.1 eV) would render a compound

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usable or unusable in the invention. Therefore, given the discussion above, the invention is not fully enabled for the full scope of the invention as claimed.

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

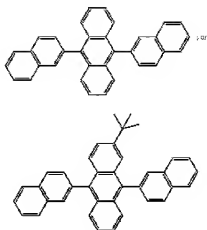
A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claims 1,4-7, 10-11, 14, 16-19, 22-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Hatwar et al. (6,475,648) with evidence from Shi et al. (Applied Physics Letters, vol. 80, no. 17, April 2002).

14. Concerning claim 1, Hatwar et al. describe an electroluminescent device comprised of a pair of electrodes (ITO and Al, Example 1, column 10, lines 20 and 34) comprised of a host and at least two dopants (column 1, lines 55-58), where the host consists of Alq or the following compounds (column 4, lines 5-25).

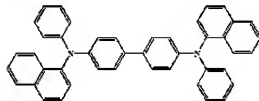
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And where the first dopant is a tetraaryl amine and includes the following structure

(column 6, lines 5-65):

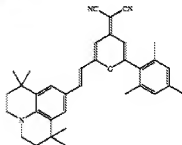
HD3 (NFB):



And the second dopant includes dicyanomethylenepyran of the following structure:

(column 9, lines 1-45)

LD7 (DCTB):



15. Hatwar et al. disclose the EV and EC values for the above compounds (Fig. 3), except the anthracene compounds shown first. Shi et al. disclose the EV and EC values for ADN (anthracene dinaphthyl). The values are as follows:

16. Component 0 (ADN): EC0 = 2.6, EV0 = 5.8, EG0 = 3.2

17. Component 1: (DCJTB): EC1 = 3.11, EV1 = 5.26, EG1 = 2.15

18. Component 2: (NPB): EC2 = 2.45, EV2 = 5.46, EG2 = 3.01

19. Therefore,

20. EV0 (5.8) > EV1 (5.26), EV0 (5.8) > EV2 (5.46)

21. EC0 (2.6) > EC2 (2.45)

22. EG0 (3.2) > EG1 (2.15), EG0 (3.2) > EG2 (3.01)

23. While Hatwar et al. does not explicitly include the anthracene compound in the electroluminescent device, due to the explicit teaching of the anthracene compound as a host material by Hatwar et al. one of ordinary skill in the art would immediately envisage the device described.

24. Concerning claims 4 and 16, Hatwar et al. teach that the concentration of the first dopant to be 0.1-35%, and the second dopant to be 0.05-4% (column 9, lines 63-64). In the examples, Hatwar et al. use concentrations of (10% and 2%) respectively. (Table 1, column 11-12).

25. Concerning claims 5 and 17, the first dopant has a hole-injection aiding property, being a well-known hole transporting material.

26. Concerning claims 6 and 18, the difference between the EC0 and EC1 of the material described above is 0.15 eV, which is less than 0.4eV.

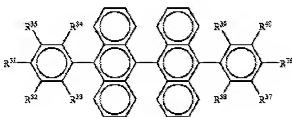
27. Concerning claims 7, 14 and 19 the molecular weight of all of the materials is less than 1500 and more than 100.

28. Concerning claims 10 and 22, the light emitting material (host) is a well known electron transporting material.

29. Concerning claims 11 and 23, the light-emitting material (host material) is a naphthylanthracene derivative.

30. Claims 1-2, 4-11, 13-14, 16-23, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Sakai et al. (US 2002/0136922) (Sakai '922) with evidence provided by Sakai et al. (6,224,966) (Sakai '966) and Hosokawa et al. (7,087,322).

31. Concerning claims 1 and 2, Sakai et al. describe an organic electroluminescent device with a pair of electrodes, a light emitting layer material (bisanthracene compound 6-1, shown below, where all R's are H), which is structurally similar to Applicant's compound (H1), DPVDPAN (identical to Applicant's compound H2) (corresponding to component 1), and DMPAVB (identical to Applicant's compound D1) (corresponding to component 2). [0055]



(6)

32. Sakai et al. (Sakai '966) disclose values for component DPVDPAN, where the ionization potential (EV1) is 5.6 eV (see column 39, lines 20-21), and an electron affinity

(EC1) of 2.7 eV (column 38, lines 46-49). Hosokawa et al. disclose values for compound 6-1 where the Ionization energy (EV0) is 5.72 eV, and the electron affinity (EC0) is 2.73 eV. (See table 1, column 39) With evidence from Applicant's specification in Table 1, the materials would have the properties discussed below.

Component 0: 6-1 (from 7,087,322) EV0 = 5.72, EC0 = 2.73, EG0 = 2.99

Component 1: H2 (from 6,224,966) EV1 = 5.6, EC1 = 2.7, EG1 = 2.9

Component 2: D1 (Compound D1) EV2 = 5.5, EC2 = 2.7, EG2 = 2.8

Therefore,

EV0 (5.72) > EV1 (5.6), EV0 (5.72) > EV2 (5.4)

EC0 (2.73) ≥ EC2 (2.6), EC0 (2.73) ≥ EC2 (2.7) (per claim 2)

EG0 (3.0) > EG1 (2.9), EG0 (3.0) > EG2 (2.8)

33. Concerning claims 4 and 16, Sakai '922, disclose that the concentration of the second dopant is 3% by weight [0055]
34. Concerning claims 5 and 17, the second dopant is a known hole transporting material, and functions as a hole injection aiding property.
35. Concerning claims 6 and 18, the difference between the EV0 and EV1 of the host and first dopant is less than 0.4 eV, and the difference between EC0 and EC1 is also less than 0.4 eV.
36. Concerning claims 7, 14, and 19, the materials described all have a molecular weight between 100 and 1500.
37. Concerning claims 8 and 20, the material described by Sakai '922 is structurally very similar to Applicant's preferred material (H1) as well as compounds on page 17 of

the specification. Therefore, absent evidence to the contrary, the compound is presumed to have the required glass transition temperature.

38. Concerning claims 9 and 21, the second dopant material described by Sakai ('922) is a styrylamine, identical to the Applicant's compound D2

39. Concerning claims 10 and 22, the dianthracene material described by Sakai ('922) is disclosed to work supplementary for the electron transport or hole transport. [0027] Therefore, it must be either electron or hole transporting.

40. Concerning claims 11 and 23, the dianthracene material described by Sakai ('922) is a phenylanthracene derivative, as shown in the structure above.

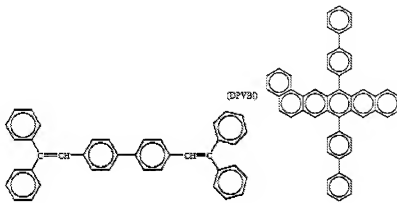
41. Concerning claims 13 and 25, Sakai ('922) further disclose two hole injecting layers between the light emitting layer and the anode, formed of TPD233, or TPD78, both of which have a phenylene diamine structure [0055].

42. Claims 1, 3-7, 9-10, 13-19, 21-23, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Fukuoka et al. (WO 2001/48116), based on English language equivalent (US 6,803,120) with evidence provided by Hosokawa et al. (Applied Physics Letters, vol. 67, no. 26, pp. 3853-3855, Dec. 1995) and Rost et al. (Synthetic Metals, vol. 146, pp. 237-241).

43. Concerning claim 1, 3 and 15, Fukuoka et al. describe an organic electroluminescent device which emits white light (both dopants emit light, per claims 3 and 15) comprising a pair of electrodes and a light emitting layer comprising a light

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emitting layer material (DPVBi), (shown below), a first dopant (F1) and second dopant PAVB (identical to applicant's compound D1).



44. Hosokawa et al. discloses the EV = 5.9, EC = 2.8 and EG = 3.1 of DPVBi (See Fig 1, page 3853), while the values for the pentacene material (F1) are not disclosed. The bandgap (EG) can be estimated from the emission wavelength of 595nm, or 2.08 eV. Rost discloses the EV and EC values for pentacene, which is another aromatic hydrocarbon with a similar structure, and an energy gap of 2.1 eV, where the EV is 5.0 eV, and the EC is 2.9 eV (see fig 1, page 238), while the compounds are not identical, they are both aromatic hydrocarbons and it would be reasonable to predict that their EV and EC values would be relatively close.

Component 0: DPVBi (Hosokawa et al.) EV0 = 5.9, EC0 = 2.8, EG0 = 3.1

Component 1: F1 (Estimated) EV1 = 5.0, EC1 = 2.9, EG1 = 2.08

Component 2: D1 (Compound D1)) EV2 = 5.5, EC2 = 2.7, EG2 = 2.8

Therefore,

EV0 (5.9) > EV1 (5.0), EV0 (5.9) > EV2 (5.5)

EC0 (2.8) ≥ EC2 (2.7),

EG0 (3.1) > EG1 (2.08), EG0 (3.1) > EG2 (2.8)

45. Concerning claims 4 and 16, Fukuoka et al. disclose that the concentration of ratio of the host, first dopant, and second dopant are 40:0.05:1, which would correlate to a concentration of the first dopant of approximately 0.12% of the total weight, and a concentration of the second dopant of approximately 2.4%. (See column 22, lines 50-52).
46. Concerning claims 5 and 17, Fukuoka et al. describe the styrylamine dopant (identical to Applicant's D1) (D1) has hole injection aiding properties.
47. Concerning claims 6 and 18, the difference between EC0 and EC2 is 0.1 eV.
48. Concerning claims 7, 14 and 19, the molecular weights of all of the materials are between 100 and 1500.
49. Concerning claims 9 and 21, the second dopant is a styrylamine compound, identical to Applicant's D1
50. Concerning claims 10 and 22, the light emitting layer material DPVBi is identical to the material shown at the top of page 20 of the specification, and is a known conductive material, since it is used in organic electronic devices, it must conduct either holes or electrons or both.
51. Concerning claims 13 and 25, the device described by Fukuoka et al. further includes a hole injection layer of TPD232 (See column 22, lines 43-44, and column 18, line 67-column 19, line 3). TPD232 is identical to TPD232 on page 40 of the specification, and has a phenylene diamine structure.

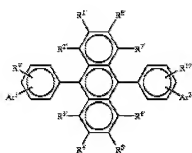
Claim Rejections - 35 USC § 103

52. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

53. Claims 8, 11-12, 20, and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuoka et al. (WO 2001/48116), based on English language equivalent (US 6,803,120) with evidence provided by Hosokawa et al. (Applied Physics Letters, vol. 67, no. 26, pp. 3853-3855, Dec. 1995) and Rost et al. (Synthetic Metals, vol. 146, pp. 237-241) as applied to claims 1 and 14 above, and further in view of Sakai et al. (6,214,481).

54. Concerning claims 8, 11-12, 20 and 23-24, Fukuoka et al. describe the organic electroluminescent device discussed above, where the host material (light emitting layer material) of the device is DPVBi. DPVBi is disclosed by Sakai et al. to have a glass transition temperature of 64°C (See column 46, lines 5-7). Fukuoka et al. disclose the use of other host materials, including styryl derivatives, anthracene derivatives or aromatic amines (column 13, lines 61-63), and disclose compounds of the following structure, where Ar¹ and Ar² are a substituted or unsubstituted aryl group, or alkenyl group. (see column 14, lines 51-53). Fukuoka et al. are silent on the specific use of a styryl anthracene material, or material with a glass transition temperature of greater than 100°C



55. Sakai et al. describe organic electroluminescent devices comprising high glass transition temperature materials as the host material. Sakai et al. specifically compare DPVDPAN (with a glass transition temperature of 105°C, per claims 8 and 20) (column 44, line 55) (identical to Applicant's compound H2), to DPVBi as the host material (See example 1 (column 43, line 34-Column 44, line 61) and comparative Example 2, (column 45, line 43-column 46, line 7). Sakai et al. report a significantly improved heat resistance for the DPVDPAN device compared with the DPVBi device. (See table 1)

Given this teaching, it would have been obvious to one of ordinary skill to use DPVDPAN as the host material in place of DPVBi in the device described by Fukuoka et al. for the purpose of improving the heat resistance of the device.

56. DPVDPAN is a phenylanthracene material containing an alkenyl group (per claims 11-12, and 23-24)

57. Claims 1-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakai et al. (6,224,966) in view of Hosokawa et al. (5,536,949).

58. Concerning claim 1-2, 5 and 17 Sakai et al. describe an organic electroluminescent device comprising an anode and cathode (pair of electrodes) and at

least two light emitting layers (column 42, lines 26-27), where the light emitting layer contains a host material and a dopant material. Sakai et al. show a preference for host materials such as DPVDPAN (identical to Applicant's material H2), but report ionization potential (EV0) of 5.6 eV, and an electron affinity (EC0) of 2.7 eV. Sakai et al. further teach that the light emitting layer contain a fluorescent substance, such as stilbene derivatives, tristyrylarylene derivatives, and distyrylarylene derivatives, but preferably distyrylarylene derivatives, such as diphenylaminovinylarylenes. (column 41, lines 37-41) Sakai et al. further teach that the light emitting layer may contain one or more fluorescent substances, but it is imperative that each fluorescent substance be of the same color or same type (column 41, lines 41-45). Sakai et al. disclose by example the use of DPAVBi as the dopant material (Similar to Applicant's compound D1). Sakai et al. further disclose that the energy gap of the fluorescent substance be smaller than that of the host substance. (column 41, lines 30-34) Sakai et al. further disclose that the same backbone skeleton, while same type means same color means colors that are emitting are classified only into of three primary colors (blue, yellow or red). (column 42, lines 1-7). Sakai et al. are silent on a specific example using two dopant materials of the same type or color in the light emitting layer.

59. Hosokawa et al. describe compounds including DPAVBi as hole injection improving materials (per claims 5 and 17), as well as other materials of a similar type, which are also useful as a fluorescent dopant (column 27, lines 49-52), where the energy gap of the host is greater than the energy gap of the dopant (column 27, lines 55-62), preferably with a difference of more than 0.1 eV. Hosokawa et al. further teach

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that the ionization energy of the host (EV0) be greater than the ionization energy of the dopant (EV1), preferably by more than 0.1 eV (column 27, lines 41-48). Hosokawa et al. describe numerous materials, but several which are closely related to DPAVB_i, as shown in Table 1, which are very similar to Applicant's compound D1.

60. Given the teaching by Sakai et al. of the use of more than one fluorescent material in the light emitting layer, with the requirement that they be of the same type or same color, and the preference for DPAVB_i as the light emitting material, and the compounds described by Hosokawa et al. which are similar to DPAVB_i, it would have been obvious to one of ordinary skill in the art to use two dopants in the light emitting layer described by Sakai et al., provided they were of the same type, which would give a relationship such as the one below

Component 0: DPVDPAN (Sakai et al.) EV0 = 5.6, EC0 = 2.7, EG0 = 2.9

Component 1: DPAVB_i (Similar to Applicant's D1) EV2 = 5.5, EC2 = 2.7, EG2 = 2.8

Component 2: DPAVB_i analog (Also similar to Applicant's D1) EV1 = 5.5, EC1 = 2.7, EG1 = 2.8

Therefore,

EV0 (5.6) > EV1 (5.5), EV0 (5.6) > EV2 (5.5)

EC0 (2.7) ≥ EC2 (2.7), EC0 (2.7) ≥ EC2 (2.7) (per claim 2)

EG0 (2.9) > EG1 (2.8), EG0 (2.9) > EG2 (2.8)

61. Concerning claims 3 and 15, since both dopants have the same properties, it would be reasonable to predict that both would emit light.

62. Concerning claims 4 and 16, Sakai et al. disclose that the ratio by weight of the host to the fluorescent substance should be between 100/1 and 10/1, which equals a range of 0.9 to 9.9% by weight

63. Concerning claims 6 and 18, the difference between the EV0 and EV1 is less than 0.4, and the difference between EC0 and EC2 is also less than 0.4.

64. Concerning claims 7, 14 and 19, the compounds described by Sakai et al. and Hosokawa et al. each have a molecular weight between 100 and 1500

65. Concerning claim 8 and 20, the host material described (DPVDPAN) is identical to Applicant's preferred host material (H2), and would be predicted therefor to have a glass transition temperature greater than 100°C

66. Concerning claims 9 and 21, the dopants are styrylamine materials.

67. Concerning claims 10 and 22, the host material described by Sakai et al. is a conducting material, having the ionization potential, and electron affinity stated above. Since the device is conductive, and the material has sufficient hole injection and electron injection properties (Column 37, line 66-column 38, line 43), therefore the material must conduct holes or electrons or both.

68. Concerning claims 11-12, and 23-24, the host material described above (DPVDPAN) is a phenylanthracene material, and also contains an alkenyl group.

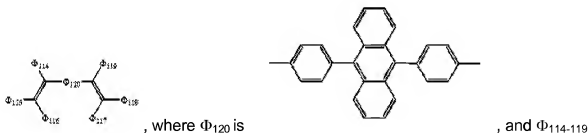
69. Concerning claims 13 and 25, the devices described by Sakai et al. further include a hole injection layer of 4,4'-bis[N,N-di(m-tolyl)amino]-4;-phenyl-triphenylamine (TPD74), which has a phenylene diamine structure.

70.

71. Claims 1-7 and 9-19, and 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobori et al. (6,285,039).

72. Concerning claim 1, Kobori et al. describe electroluminescent devices comprising an anode and cathode (pair of electrodes) and a light emitting layer. The light emitting layer is a mixed layer of hole transport and injecting material and electron transport and injecting material doped with coumarin compounds, quinacridone compounds, or styryl amine compounds. (column 4, lines 5-9) The host for the light emitting layer includes phenylanthracene derivatives and tetraarylethylene derivatives (column 22, lines 54-56), and that the mixture of the electron transporting compound and the hole transporting compound can be determined in accordance with carrier density and carrier mobility (column 24, lines 39-45).


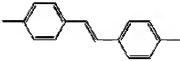
73. Electron transporting host materials include compounds such as compound E-4-701 (shown below) (column 381, line 32-column 382, line 36 and column 513-514) (correspond to component 0)



are phenyl

74. Hole transporting host materials include compounds such as H-2-501 (shown below) (column 81, line 35- column 82, line 37, and column 103-104). (corresponds to component 2)

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75.  where Φ_4 is , and Φ_5, Φ_8 are phenyl.

76. Dopants include coumarins or styrylamines as discussed above, and may be used alone or in a mixture of two or more (corresponds to component 1) (column 31, lines 7-8).

77. Because of the similarity in the structures, it would be reasonable to predict that the EC and EV and EG values would be roughly equivalent to those reported in Applicant's Table 1.

78. While Kobori et al. do not explicitly teach the above combination, due to the general teaching combined with the explicit structures reported by Kobori et al. it would have been obvious to one of ordinary skill in the art to construct the electroluminescent device as described, since it would be predicted to work as described.

79. Concerning claims 2-3, and 15, the case where the styrylamine compound is used as a dopant in a mixed layer of the anthracene compound (electron transporting host) and styrylamine host (hole transporting host), would describe a device according to claims 2 and 3.

80. Concerning claims 4 and 16, Kobori et al. disclose that the level of the dopant (either coumarin or styrylamine) in 0.01 to 20% by weight of the light emitting layer (column 24, lines 3-6).

81. Concerning claims 5 and 17, Kobori et al. describe the electroluminescent device discussed above. As described, the second dopant is a hole transport material, as described above.

82. Concerning claims 6 and 18, Kobori et al. describe the electroluminescent device discussed above, where the materials have structures very similar or identical to materials of Applicants' table 1, where the EC level of the light emitting layer material and the EC2 of the second dopant material are within 0.4 eV.

83. Concerning claims 7, 14 and 20, Kobori et al. describe the electroluminescent device discussed above, where all the materials have a molecular weight between 100 and 1500.

84. Concerning claims 9, and 21 Kobori et al. describe the electroluminescent device discussed above, where the either or both of the first dopant and second dopant are styrylamine derivatives

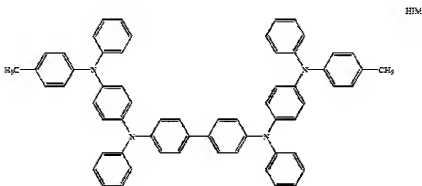
85. Concerning claims 10 and 22, Kobori et al. describe the electroluminescent device discussed above, where the host (light emitting layer material) has electron transport properties as described above.

86. Concerning claims 11 and 23, Kobori et al. describe the electroluminescent device discussed above, where the host (light emitting layer material) is a phenylanthracene derivative.

87. Concerning claims 12 and 24, Kobori et al. describe the electroluminescent device discussed above, where the phenylanthracene derivative has an alkenyl group.

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88. Concerning claims 13 and 25, Kobori et al. describe the electroluminescent device discussed above, including a hole injection layer comprised of HIM (shown below), which has a phenylenediamine structure. (column 559, lines 1-4 and column 557-558).



89. Claims 8 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobori et al. (6,285,039) as applied to claim 1-7 and 9-13 above, and further in view of Hosokawa et al. (6,743,948).

90. Concerning claims 8 and 20, Kobori et al. describe the electroluminescent device discussed above, but do not explicitly disclose the glass transition temperature of the light emitting layer. However, since the majority of the layer is an anthracene compound, the glass transition temperature can be estimated.

91. Hosokawa et al. disclose that an unsubstituted anthracene has a glass transition temperature of 100°C or lower, but that adding substituents increases the glass transition temperature. Therefore it would be reasonable to predict that the glass transition temperature of a layer comprising most the substituted anthracene described by Kobori et al. would have a glass transition temperature above 100°C.

Response to Arguments

92. Objections to the specification are withdrawn in light of Applicant's amendments.

93. Objection to claim 11 is withdrawn in light of Applicant's amendment.

94. Rejections in light of Hatwar et al. (6,475,648) and Jarikov (7,183,010) are withdrawn in light of the certified translation of Applicant's Priority Document.

95. Applicant argues that given the processes described in the specification, the claims as written are enabled. However, as discussed in the enablement portion of this action, there is a lack of essential details describing the processes employed by application to allow one of ordinary skill to produce the values that are required in order to fully enable the invention as claimed. While the general methodologies are routine, the nature of different instrumentation, and other factors does not allow significant modification in the processes from those which were employed by Applicant. In terms of measuring the valence energy (ionization potential, as illustrated, disclosing the specific instrument on which a measurement was taken is insufficient, since even the same instrument can produce significantly varied results. More is required to enable one of ordinary skill to ensure that the values gained are accurate within the scope of the current invention. Given the very close values for the specific compounds described, and lack of specific ranges, and the normal variability of the instrumentation, an individual of ordinary skill is reduced to random chance as to whether or not a measured value will meet or not meet the parameters described in the invention. A similar issue arises with the measurement of the energy gap (and therefore the electron

affinity (conductance energy). The method described requires a selection of a point on a readout, which will vary from individual to individual. Critical parameters are missing from the method disclosed in the specification, such as the concentration of the samples, and random variability between instruments will not enable an individual of ordinary skill to produce values with the accuracy required by the scope of the claims. A shift of less than 10nm in the selection of the point at which the absorbance band begins to raise can change the resulting value of a particular compound into or out of the scope of the present claims. For these reasons, one of ordinary skill would not be enabled to create the scope of the invention as claimed.

96. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the method by which the conductance and valence values are measured) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

97. Applicant argues that the rejection in view of Hatwar et al. (6,475,648) is invalid because the methods used by Shi (which provides evidence of the specific values) to measure the particular experimental values are different than those of the Applicant. However, Applicant's methods for measuring the values are not part of the claim. Therefore, experimentally determined values may come from any source to provide evidence that the claims are anticipated.

98. Concerning rejections over Kobori et al., Applicant agrees that Kobori describes materials similar to the compounds in Applicant's specification, and argues that "although Kobori discloses compounds with chemical structures that are similar to the compounds disclosed in Applicant's specification at Table 1, having a similar structure does not ensure that Applicant's claimed valence electron level, conduction level or energy gap relationships will be satisfied. Applicant cites the submitted Rule 132 declaration, as evidence that Kobori does not disclose the elements of the claimed invention. However, the declaration compares only a single host material (Different than the material described by Kobori et al.) with a handful of dopant materials, some of which are within the scope of Kobori et al. and some of which are not. The dopant (D2) is the only second dopant in an inventive example, and is similar to compounds described by Kobori et al. The declaration compares this dopant material to two other second dopants, NPB and D6 (rubrene). However, neither of these has a similar structure to the dopant D2, or the styrylamine material described by Kobori et al., Dopants D1 and D5 are illustrated as the first dopant, but both of these fall within the scope of claim 1, and only first dopant D2 falls within the scope of claim 2. Applicant has failed to show with this declaration how materials with similar structure would NOT meet the requirements of the invented claims.

99. Furthermore, the declaration as filed does not support the full scope of the claims as written, since they compare a very small number of materials which do not form a representative sample of the breadth of the current claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL E. NELSON whose telephone number is (571)270-3453. The examiner can normally be reached on M-F 7:30am-5:00pm EST (First Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho can be reached on 571-272-1123. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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